

# Nuclear Chemistry Worksheet K

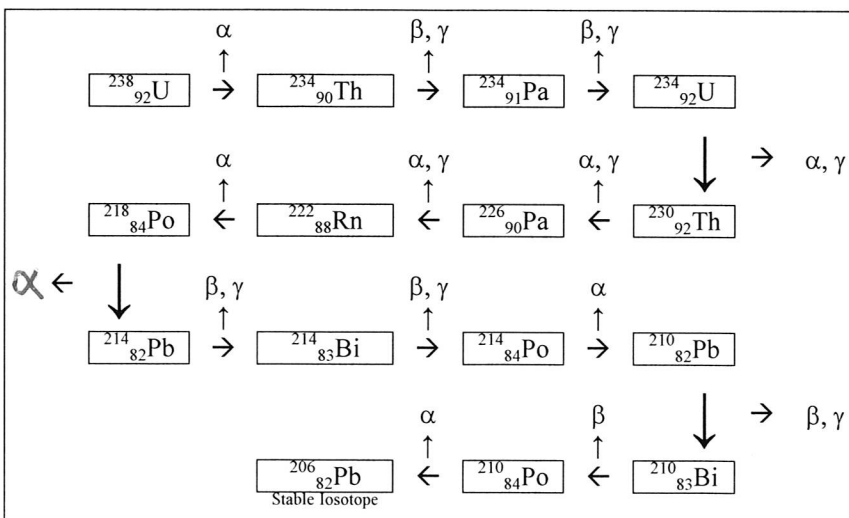
**Directions:** Identify the following as alpha, beta, gamma, or neutron.

1.  $\frac{1}{0}\text{n}$  \_\_\_\_\_
2.  $\frac{0}{-1}\text{e}$  \_\_\_\_\_
3.  $\frac{4}{2}\text{He}$  \_\_\_\_\_
4.  $\frac{0}{0}\gamma$  \_\_\_\_\_
5. Nuclear decay with no mass and no charge \_\_\_\_\_
6. An electron \_\_\_\_\_
7. Least penetrating nuclear decay \_\_\_\_\_
8. Most damaging nuclear decay to the human body \_\_\_\_\_
9. Nuclear decay that can be stopped by skin or paper. \_\_\_\_\_
10. Nuclear decay that can be stopped by aluminum. \_\_\_\_\_

**Complete the following nuclear equations.**

11.  $\frac{42}{19}\text{K} \rightarrow \frac{0}{-1}\text{e} + \underline{\hspace{2cm}}$
12.  $\frac{239}{94}\text{Pu} \rightarrow \frac{4}{2}\text{He} + \underline{\hspace{2cm}}$
13.  $\frac{9}{4}\text{Be} \rightarrow \frac{9}{4}\text{Be} + \underline{\hspace{2cm}}$
14.  $\frac{235}{92}\text{U} \rightarrow \underline{\hspace{2cm}} + \frac{231}{90}\text{Th}$
15.  $\frac{6}{3}\text{Li} \rightarrow \frac{4}{2}\text{He} + \underline{\hspace{2cm}}$
16.  $\underline{\hspace{2cm}} \rightarrow \frac{142}{56}\text{Ba} + \frac{91}{36}\text{Kr} + 3 \frac{1}{0}\text{n}$

## **Nuclear Decay Series**



*The figure maps the radioactive decay of uranium-238 to lead-206. Use the figure to answer the following questions.*

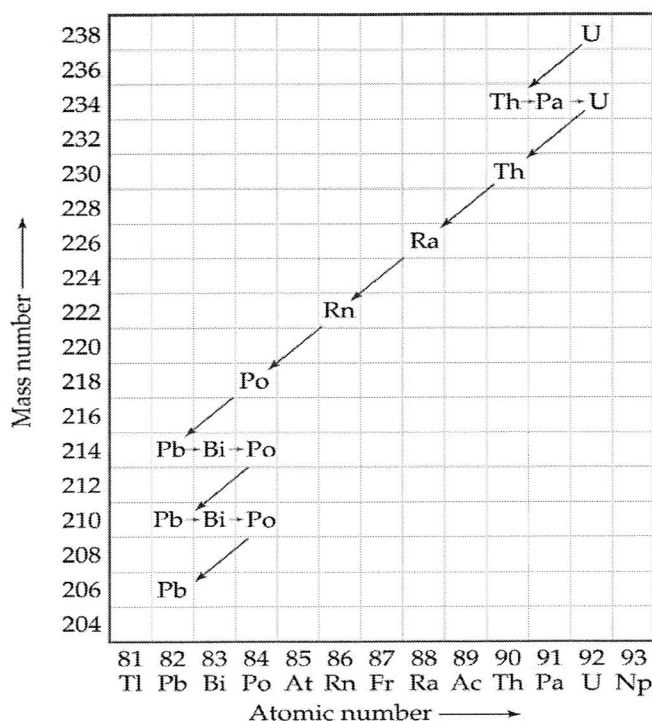
17. How many alpha particles are produced as one atom of uranium-238 decays to an atom of lead-206?  
 \_\_\_\_\_
18. How many beta particles?  
 \_\_\_\_\_

19. Write an equation showing that when protactinium-229 goes through two alpha decays, francium-221 is formed.

20. Write the nuclear equation for the decay of Po-210 if it undergoes 2 consecutive alpha decays followed by a beta decay followed by another alpha decay.

21. The decay chain (or series) of uranium-238 is shown in the following figure. What is the *final product* in this decay series?

22. Using the figure to the right, list each type of decay that uranium-238 goes through to become lead-206.



23. Thorium-232 undergoes radioactive decay until a stable isotope is reached. Write the reactions for the decay of Th-238. There are eleven steps beginning with Alpha decay with each product becoming the reactant of the next decay. Circle the final Stable isotope.

- Alpha: \_\_\_\_\_
- Beta: \_\_\_\_\_
- Beta: \_\_\_\_\_
- Alpha: \_\_\_\_\_
- Alpha: \_\_\_\_\_
- Alpha: \_\_\_\_\_
- Alpha: \_\_\_\_\_
- Beta: \_\_\_\_\_
- Beta: \_\_\_\_\_
- Alpha: \_\_\_\_\_
- Beta: \_\_\_\_\_

# Nuclear Chemistry Worksheet K

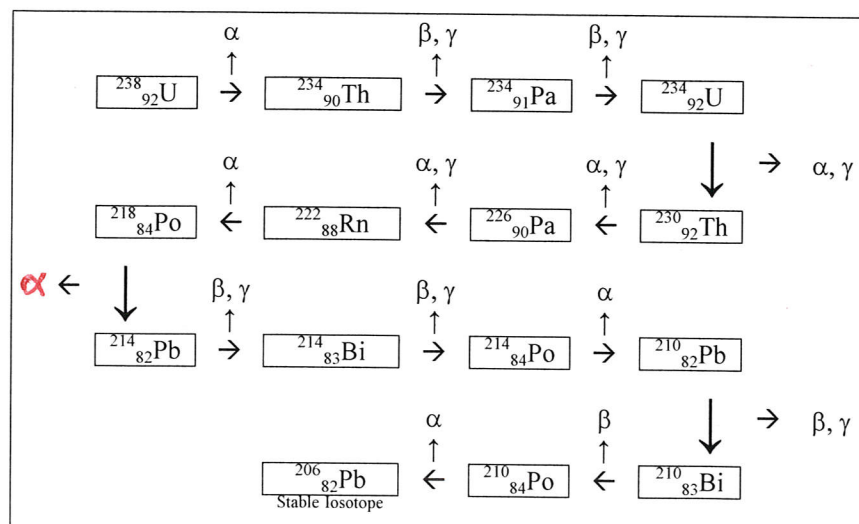
**Directions:** Identify the following as alpha, beta, gamma, or neutron.

1.  $\frac{1}{0}n$  neutron
2.  $\frac{0}{-1}e$  beta
3.  $\frac{4}{2}He$  alpha
4.  $\frac{0}{0}\gamma$  gamma
5. Nuclear decay with no mass and no charge gamma
6. An electron beta
7. Least penetrating nuclear decay alpha
8. Most damaging nuclear decay to the human body gamma
9. Nuclear decay that can be stopped by skin or paper. alpha
10. Nuclear decay that can be stopped by aluminum. beta

**Complete the following nuclear equations.**

11.  ${}_{19}^{42}K \rightarrow {}_{-1}^0e + {}_{20}^{42}Ca$
12.  ${}_{94}^{239}Pu \rightarrow {}_2^4He + {}_{92}^{235}U$
13.  ${}_4^9Be \rightarrow {}_4^9Be + {}_0^0\gamma$
14.  ${}_{92}^{235}U \rightarrow {}_2^4He \text{ or } {}_2^4\alpha + {}_{90}^{231}Th$
15.  ${}_3^6Li \rightarrow {}_2^4He + {}_1^2H$
16.  ${}_{92}^{236}U \rightarrow {}_{56}^{142}Ba + {}_{36}^{91}Kr + 3 {}_0^1n$

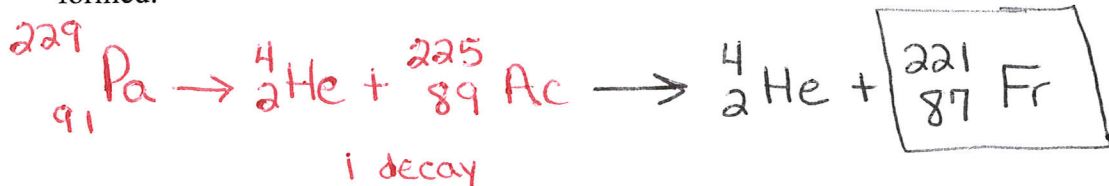
## Nuclear Decay Series



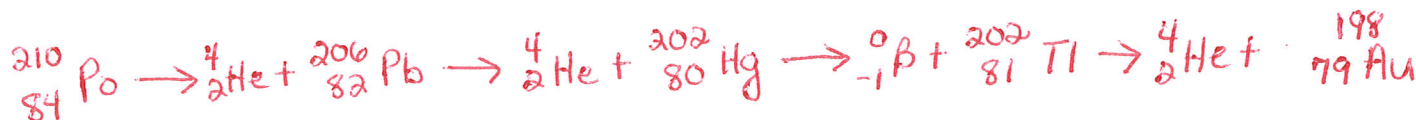
The figure maps the radioactive decay of uranium-238 to lead-206. Use the figure to answer the following questions.

17. How many alpha particles are produced as one atom of uranium-238 decays to an atom of lead-206?  
8
18. How many beta particles?  
6

19. Write an equation showing that when protactinium-229 goes through two alpha decays, francium-221 is formed.

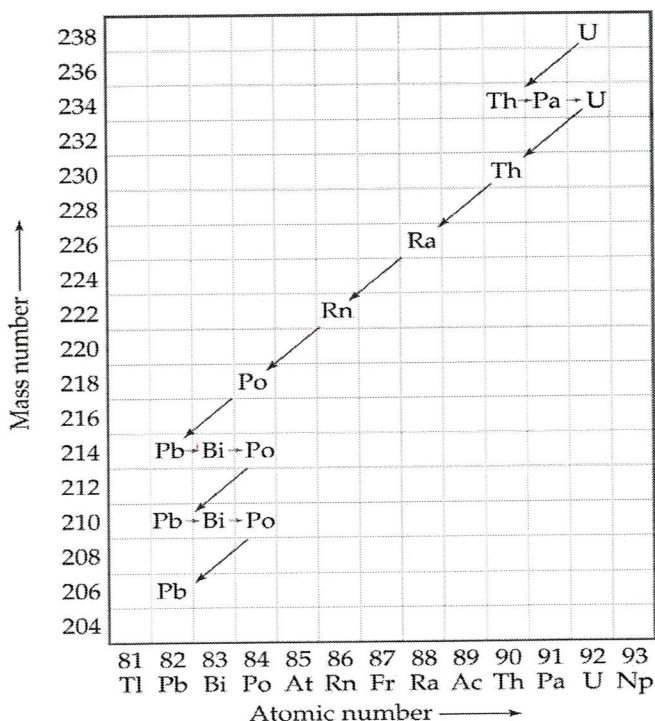


20. Write the nuclear equation for the decay of Po-210 if it undergoes 2 consecutive alpha decays followed by a beta decay followed by another alpha decay.



21. The decay chain (or series) of uranium-238 is shown in the following figure. What is the **final product** in this decay series?

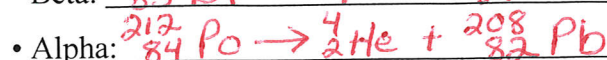
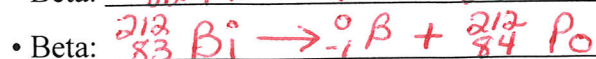
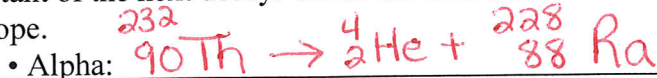
Pb-206



22. Using the figure to the right, list each type of decay that uranium-238 goes through to become lead-206.

alpha → beta → beta → alpha → alpha  
 → alpha → alpha → alpha → beta → beta  
 → alpha → beta → beta → alpha

23. Thorium-232 undergoes radioactive decay until a stable isotope is reached. Write the reactions for the decay of Th-232. There are eleven steps beginning with Alpha decay with each product becoming the reactant of the next decay. Circle the final Stable isotope.





NAME \_\_\_\_\_

Hour \_\_\_\_\_

## Scientific Method and Observation Worksheet

While performing experiments scientists must rely on making specific observations. Observations are based on information gained directly from our senses, what we **see, hear, taste, touch or smell**, or extensions of these senses with scientific tools such as microscopes, scales, thermometers, pH meters and so on. Based on these observations scientists must make judgments or decisions about what they are studying. Observations can be either of a qualitative or quantitative nature. Quantitative observations deal with numerical measurements or counts while qualitative observations deal with qualities such as color, type of material, smells, shapes etc.

For the following list determine if they are A: *quantitative* or B: *qualitative* observations.

1. \_\_\_\_\_ The ball has a mass of 587.8 grams.
2. \_\_\_\_\_ The lady is 154.5 cm tall.
3. \_\_\_\_\_ The ball is made of plastic.
4. \_\_\_\_\_ The object smells like apples.
5. \_\_\_\_\_ The box has twelve corners.
6. \_\_\_\_\_ The liquid is at 39 degrees C.
7. \_\_\_\_\_ The coin appears round.
8. \_\_\_\_\_ The ball has a mass of 875.2 grams.
9. \_\_\_\_\_ The ice rink is flat.
10. \_\_\_\_\_ The soccer ball has three colors.

11. List the five steps of the scientific method.

- a.
- b.
- c.
- d.
- e.

12. Number the following in order, according to the Scientific Method.

- a. \_\_\_\_\_ your watch stopped
- b. \_\_\_\_\_ you put the watch in the oven to dry
- c. \_\_\_\_\_ you decide the likely cause is that water got into the watch
- d. \_\_\_\_\_ the watch works, it must have been wet
- e. \_\_\_\_\_ you call the jeweler to help figure out what happened

